

## PhD position starting in the autumn of 2022

*Center for Materials Forming, Mines Paris  
&  
Health Engineering Center, Mines Saint-Étienne*

### **Bio-based nanocomposite hydrogels and aerogels for osteo-articular applications**

*financed by Carnot M.I.N.E.S.*

A major need exists to improve the treatment of bone trauma and osteo-articular pathologies such as osteoarthritis, which are among the leading causes of disability and loss of quality of life in the world. These health issues are closely linked to the damage or degeneration of osteo-articular tissues. The improvement of existing therapies is based on the development of innovative materials providing clinicians with new solutions for the reconstruction of these tissues. However, there is currently a lack of multifunctional materials that are hydrated, biodegradable, mechanically competent and capable of providing a therapeutic solution to the mentioned clinical challenges.

The objective of the proposed project is to prepare hydrogels and aerogels (i.e. wet and dry polymer networks) as resorbable tissue engineering matrices whose chemical, microstructural and mechanical characteristics can be adjusted to meet the needs of the targeted osteo-articular applications. To this aim, biomaterials will be fabricated by combining matrices of bio-based polymers and inorganic fillers promoting osseointegration. Multiscale modeling tools will be used for optimization purposes.

This highly interdisciplinary project is located at the interface of materials science, numerical modelling and biomedical applications. The project will be carried out in two laboratories: (1) the majority of the work will be performed in the Center for Materials Forming (CEMEF) of Mines Paris, which has significant expertise in the processing, forming and modeling of polymer-based materials, including bio-based hydrogels and aerogels, and (2) secondments will take place in the Health Engineering Center of Mines Saint-Étienne, which has extensive experience in the biological evaluation of biomaterials for osteo-articular applications.

**Keywords:** Polymers, gels, physico-chemical and mechanical properties, biomaterials, numerical modelling, osteo-articular applications

**Profile:** Knowledge in materials science, polymers as well as numerical modelling; fluent in English; highly motivated; pro-active; MSc thesis completed

**Duration:** 3 years, starting in autumn 2022

**Gross annual salary:** ± 26 k€

**Locations:** CEMEF (Mines Paris in Sophia Antipolis, France), Health Engineering Center (Mines Saint-Étienne, France)

**People involved:** Dr. Sijtze Buwalda, Dr. Yannick Tillier, Dr. Tatiana Budtova (Mines Paris), Dr. David Eglin (Mines Saint-Étienne)

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Please send your detailed CV, motivation letter, marks of your Bachelor and Master and at least two e-mail addresses of reference persons.